Law Enforcement and today's Live video Surveillance Technology

by

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The Command College Futures Study Project is a FUTURES study of a particular emerging issue of relevance to law enforcement. Its purpose is NOT to predict the future; rather, to project a variety of possible scenarios useful for strategic planning in anticipation of the emerging landscape facing policing organizations.

This journal article was created using the futures forecasting process of Command College and its outcomes. Defining the future differs from analyzing the past, because it has not yet happened. In this article, methodologies have been used to discern useful alternatives to enhance the success of planners and leaders in their response to a range of possible future environments.

Managing the future means influencing it—creating, constraining and adapting to emerging trends and events in a way that optimizes the opportunities and minimizes the threats of relevance to the profession.

The views and conclusions expressed in the Command College Futures Project and journal article are those of the author, and are not necessarily those of the CA Commission on Peace Officer Standards and Training (POST).

Law Enforcement and Today's Live Video Surveillance Technology

In December 2009, a Los Angeles County Sheriff's Deputy responded to a 911 hang up call at a convenience store, a routine call by most standards. As the deputy walked into the store she passed a male subject who was on his way out. At the time, she had no idea the subject had just robbed the store at gunpoint. A video recovered from store cameras later showed the suspect standing at the counter with a gun in his hand, but he discreetly put the weapon in his pocket before turning to walk past the Deputy as he exited the store. When he was arrested, he said the only reason he did not shoot the Deputy was because she was a woman. (Figueroa, 2010) How differently could this story have transpired if law enforcement had access to monitor the video cameras inside the store once they received the 911 call, and not until after the Deputy had already inadvertently encountered the perpetrator of a crime?

The availability of live video over the Internet and via other wireless sources has expanded greatly over the past several years. The advent of the affordable smart phones capable of capturing high quality video has made it possible for just about everyone to be a video journalist. Affordable home and business video surveillance systems have allowed many more consumers to utilize this technology as well. Sales of video surveillance equipment were reported up by 8 to 12 percent in 2007 from the previous year. In addition, the video surveillance home market has seen increases and is now more than 10 percent of what has traditionally been a commercial market. (Gager, 2008) What makes these systems unique from earlier systems is that they are no longer just recording what the camera captures, but are now capable of broadcasting a live video feed to any computer or smart phone with an Internet connection. As the ability to upload live streaming video from cellular phones continues to increase, citizens will undoubtedly expect the police to take advantage of this capability, just as

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they have come to expect law enforcement to accept and deliver reports and other information

via the internet.

The use of live video surveillance in law enforcement is not a new idea. Law

enforcement agencies across the globe have used cameras to monitor public areas for years. In

France, there are more than four hundred thousand surveillance cameras, and there are more than

four million cameras in England. (Motorola Inc., 2008) London's system has been in use for

many years and is being reviewed for its efficiency. A recent report indicated that for every

1000 cameras they solve one crime. At the same time they estimate 70 percent of murder

investigations have been solved with the help of video retrieved from the CCTV system. (BBC

News) Of course, it is difficult at best to estimate how many crimes are prevented due to the

cameras in an area. In reviewing efficiency they are now looking at ways of better utilizing the

system. Like any other system or program, it needs to be reviewed, monitored, and updated.

Many agencies in the United States have cameras placed in parks and around other city

facilities. The problem with most U.S. systems is that they are not monitored. They are only

utilized after a crime has occurred in order to attempt to identify suspects. Closed circuit

television (CCTV) cameras have also been in use for many years in stores and businesses. The

use of CCTV cameras to prevent crimes has been somewhat effective in dissuading shoplifters

and petty thieves from committing crimes. However, as a crime-solving tool, the CCTV cameras

have been highly ineffective. (Bowcott, 2008)

In a 2001, a Police Magazine article they asked if streaming video would be a cop's new

best friend. The article discussed the delays involved in streaming the video from camera to

monitor and stated the ability of streaming this video to a mobile patrol unit was close to

becoming a reality. Today, it is a reality; however the expense and network requirements are

still a hurdle for most mid size and smaller agencies. The 2001 article describes the major stumbling block for transmission to mobile units as bandwidth limitations, a problem even today although to a lesser extent. (Huntington, 2001) The costs to upgrade infrastructure and reduce the bandwidth limitation problem is in the billions. While the government works to set aside funding for improvements, software and hardware manufacturers have been working to develop systems that utilize less bandwidth. These are still not inexpensive solutions with many costing tens of thousands of dollars. For example, in Chandler Arizona they are installing a high-speed wireless network in The Chandler Center and expanding existing network in additional public areas. This relatively small project comes at a cost of $120,000. (Jensen, 2010)

Both legal and financial issues hamper the possibility of implementing this new technology. These hurdles aside, it is important for law enforcement to at least be knowledgeable in this technology. Its potential for abuse as well as the public's expectation for law enforcement to utilize it is reason enough for a department to educate themselves.

Today, it is commonplace for cell phone users to record video on their phone and immediately upload it to web based services such as YouTube. As video streaming technology continues to advance, the delay between the recording through the use of personal recording devices and uploading to the web will be replaced with a real time streaming video. Real-time video surveillance systems are increasingly being deployed and are seen as effective methods of addressing a wide range of security challenges in both the private and public sectors. For instance, the Fontana School District's camera system has allowed them to monitor large quad areas full of students and direct its security officers to potential problem areas. It is the advantage of viewing these areas from above that enables them to more efficiently deploy their limited resources.

Large wireless video systems can monitor hundreds of cameras. The cameras can be portable, mounted in fixed locations, or attached to mobile platforms. Larger agencies and law enforcement in other countries with systems already installed use monitoring stations to watch the camera feeds. This requires around the clock monitoring to be effective. These systems also require human operators to identify events and determine what action to take. However, it is highly unlikely that any single individual would be capable of monitoring a system of a hundred or more cameras and employing a team of individuals would quickly become cost prohibitive. Watching two or three running videos on a single monitor without missing some details is next to impossible, so one can only imagine the difficulty of watching, say, 300 camera feeds at once.

Cutting edge video technology software systems are attempting to address this problem. Analytics software can be used to monitor the cameras and alert the viewers or generate alarms when potential problems occur, such as people entering an area or the removal of an item from the field of view. Like most software programs, this software can be programmed. This programming can allow for the viewer to be alerted when the camera detects perimeter intrusions, traffic accidents, stolen vehicles or large crowd gatherings. These video analytic programs in affect act as a force multiplier allowing a few trained personnel to monitor hundreds of cameras. (Motorola, Inc., 2008)

It is virtually impossible for humans to focus on a mass array of video monitors for very long before they stop seeing anything at all. (Dees, 2011) This is where video analytics software comes into play. Video analytics software "watches" the feed from a camera or the playback from a recorder, and alerts the operator when certain patterns have changed in a way preset into the program. For example, in a security passageway where traffic is supposed to be moving in a single direction, movement the other way will trip the flag if the software has been

set that way. Another alert could occur when an object not normally in view of the camera appears and remains in one spot, like a bomb-carrying parcel might.

A somewhat futuristic use of this technology could include the following scenario... *A fight in a park triggers a motion sensor activated camera that alerts an officer in a central command center. The officer who sends the live feed to the dispatcher views the live video from that camera. The dispatcher notifies officers of the crime and sends the information along with the live video feed to the officer's mobile computer. As the officers respond, they continue to watch the crime unfold through the real time video feed.   As officers arrive, the command center now receives a real time video feed from the officer's in-car camera. The officers arrive on scene and are able to apprehend the suspects. All of the video footage is stored and available for use in court to convict the suspects.* (Motorola, Inc., 2008) While this scenario may seem somewhat farfetched, this technology exists today. For those who may wish to consider it, the cost is also more affordable than one might imagine.

The Fontana Unified School District spent a million dollars on their system of 370 cameras. That price tag included storage, monitors, and the software needed to operate the system. What it did not include was the fiber optic cable system they needed to connect it together. As with any video system, costs are difficult to estimate as camera costs alone can vary from $700 to $2600. A system alone, though, is not foolproof. It doesn't take much imagination to envision an innocent situation that would meet the conditions described above. This is why it is still vital to have a human operator involved. If the system notes an exception and sounds the alarm, ~~the operator~~ the operator brings up the screen where the exception occurred and determines whether it's something harmless or deserving of having an officer respond to further investigate. (Dees, 2011)

Technology Issues Hampering the Use of Live Video Surveillance

The use of widespread live video surveillance has two primary issues that limit its use. First, the infrastructure to send the video information from cameras to the monitoring systems is restricted by the size of the cable or wireless units and is referred to as bandwidth. There is only a certain amount of information that can be transferred at one time. As more information is sent through the system, the rate of flow is slowed. A typical analogy used to describe this limitation is that of a garden hose. When a small volume of water is sent through a garden hose, it flows quickly. As the water volume through the hose increases, the rate of flow also increases up to the point that the volume of water is capable of handling is reached. At that point any excess volume of water will back up. It is like sending more water through a fire hose than a garden hose.

A Strategy Analytics survey found the United States is currently ranked 20th in broadband services out of 58 countries. (Mercer, 2008) The median U.S. broadband speeds are less than 5 megabits per second. According to a survey by the Technology and Innovation Foundation, Japan's average is 63 Mbps, and South Korea is 49Mbps, far greater than the U.S. median of 5 Mbps. (Mercer, 2008) According to the Department of Commerce, 40% of communities in the United States lack high-speed or broadband Internet service. This service would be imperative for someone wanting to send real time video to law enforcement from a surveillance system.

Help is on the Way

The FCC hopes to increase the number of households with high-speed Internet access to 100 million by 2020. (Tessler, 2010) President Obama said he would allocate $18 billion in federal funds to in order to connect 98 percent of the nation to the Internet in five years. The Government would fund a new rural 4g wireless network and a mobile communications system

for fire, police and emergency responders. This upgrade is part of his plan to reshape the nation's infrastructure of deteriorating roadways and manufacturing plants into one with high-speed railways and high-speed Internet networks that the president believes are essential ~~for the~~ so the United States can be more competitive in the global economy. (Kang, 2011)

The second hurdle is interoperability between systems. Video systems and the software used to view and operate them are not always compatible with other competing systems. A school district, stadium, mall, or other business may have a state of the art video surveillance system in place; however, due to software incompatibility, they may not be able to share that system with another agency. The video surveillance industry today is working to establish standards for software and camera capabilities in order to address these incompatibility issues. Software manufacturers as well as third party software vendors are also attempting to address compatibility differences. For example, Cisco offers an "any-to-any-for-any" video surveillance and network infrastructure solution capable of providing vendor interoperability. Systems like this are capable of interfacing traditional CCTV systems with wireless systems as organizations transition from the old system to the new.

Motorola sees the future of wireless real time video streaming as a fully integrated technology. They see the technology greatly improving the effectiveness and efficiency of first responders and others from command centers to the incident. Video surveillance systems can increase efficiency by providing supervisors and officers the ability to analyze a situation early on, which in turn allows for a better deployment of resources. Motorola is working with public safety agencies so they will have the capability of streaming real time video from patrol cars back to command centers and other patrol units. Through software applications, the real time video will be capable of being sent to units from other agencies as well. Further into the future,

links to private sector video will be commonplace. This will enhance the amount of data available to law enforcement when responding to an incident. Law enforcement will rely on real time video in the same manner they currently do with voice communications. (Motorola Inc., 2008)

The use of this type of technology is evidenced by systems like the one recently installed by the Ontario, California Police Department. Their system will stream live video from a camera mounted on a helicopter to a mobile command post on the ground. The system enables them to receive real-time information for firefighters and law enforcement to use on any critical incidents or day-to-day. (Marquez, 2010) This system is still in the installation phase and is expected to be operational in the upcoming months.

Funding Issues

The cost of video monitoring systems for mid-size agencies and municipalities can make their use prohibitive. Developing and maintain these complicated systems can be expensive as well. Law enforcement has a finite amount of tax dollars available for such projects and deciding how best to spend them is critical. The utilization of camera systems capable of sending real time video to law enforcement is arguably well-spent dollars as it allows for constant monitoring of locations and a more informed response by giving responding officers and those monitoring the cameras the ability to analyze the scene before they arrive.

With current budget constraints, it may be best to tap into the resources currently within the agency. Most agencies have officers who are tech savvy. These officers are the ones that seem to always have the newest phone and latest notepad. Tasking these officers to research the latest video systems and then presenting that information to staff could prove useful. These same officers could also be tasked with in-house training once a system has been deployed.

Grants are another source of funding for these projects. The video system installed on

Ontario's helicopter-cost $1.175 million. The money for this project came from a regional

initiative grant and from homeland security funds. (Marquez, 2010) Saginaw Michigan installed

17 video cameras at a water/skate park last year and plans to add more in other parts of the city.

They will use a federal grant of $300,000 to pay for the additional cameras. (Keen, 2011) Today

there are still grants available through Homeland Security. In some cases, it may also be

possible to at least partially fund a program through asset forfeiture funds.

Partnerships with other entities such as school districts can also ease the funding burden.

For example, Northern Michigan University partnered with towns nearby to expand cell towers

so elementary schools, police and residents could also access wireless networks fast enough to

process streaming videos without a wired connection. The program will fund a new public

safety network so first responders from various emergency services will be able to communicate

on one system, sending video files and e-mails during disasters. (Kang, 2011)

On a somewhat grander scale, the Atlanta Police Department will soon be opening a

Video Integration Center designed to compile and analyze footage from thousands of public and

private cameras throughout the City. Images from as many as 500 cameras will flow into the

Center. The system will integrate data supplied by private entities such as CNN, America's Mart

and Midtown Blue as well as public agencies such as the Georgia department of Transportation

and the Federal Reserve. Funding for the new Center comes from $2.6 million in federal funds.

(Garner, 2011) This system takes advantage of cameras already installed by other entities as

well as installation of new cameras in key areas.

Opposition to Video Surveillance

The notion of law enforcement utilizing cameras from the private sector and located on private property will surely raise privacy concerns. The American Civil Liberties Union (ACLU) has argued even the utilization of cameras in public areas are an invasion of privacy. They contend surveillance cameras are a bad investment and do not prevent, reduce or solve crime. Their 2008 report reviewed studies from UC Berkley on the City of San Francisco's camera system, and a study from USC that reviewed a camera system in Los Angeles. The report found that in both studies, no significant impact on crime was noted. The ACLU recommends against spending scarce public safety funds for cameras systems. Rather, they report improved lighting, a less intrusive measure than camera systems has been found to reduce crime by an average of 20%. (Biale, 2008) In a 2007 report, Under the Watchful Eye, the ACLU addressed its concerns regarding civil liberties and the use of government run video surveillance systems. They raise concerns over lack of guidelines to guard against abuse and the installation of camera systems with little or no public debate.

Although there is opposition to video surveillance programs, the courts have ruled that people have no expectation of privacy in public settings. (Keen, 2011) As more cameras are installed and brought online, a balance between privacy and security concerns needs to be established. Certainly, a well-thought out program using camera surveillance can net substantial positive results.

In 2006 the Los Angeles Police Department deployed cameras in the Jordan Downs housing project. They found that by informing the citizens in the neighborhood the cameras were in place and recording them they actually modified behavior in the neighborhood. (Motorola, Inc., 2007) During the first year of the use of the cameras crime in Jordan Downs

decreased by 40 percent and was down another 32 percent in the first quarter of the following year. (Motorola, Inc., 2007) Other examples are:

- A 2006 study completed by Temple University on an 18 camera system installed in Philadelphia reported a 13 percent reduction in disorder crime (drug sales, assaults, and vandalism) while violent crime rates were not affected. (Kirk, 2010)

- Researchers from the Urban Institute in Washington D.C. evaluated two neighborhoods in Chicago IL where fairly high concentrations of cameras had been installed. They examined statistics for both neighborhoods and found that in one neighborhood drug, robbery, weapons offenses and overall crime had dropped significantly after the cameras were installed. (Meincke, 2010) Yet in the second neighborhood there was virtually no change in crime since the cameras were installed. The researchers were unable to identify specific reasons for the disparity, although they did note that, for every dollar spent on cameras, there was more than a $2 savings of money from crimes prevented. (Meincke, 2010)

Most interestingly, researchers at the Urban Institute found that, for cameras to have a real impact, there needs to be both a perception and reality that someone is actually monitoring them. (Meincke, 2010) In Philadelphia, local government believes the public voiced its support when they received a 75 percent "Yes" vote supporting police surveillance in a referendum that was on the city ballot in 2006. (Kirk, 2010)

Conclusion

Law enforcement is faced with many challenges regarding real time streaming video. As technology in this area improves, the ability for more persons to utilize it continues to grow.

Cell phone technology specific to Wi-Fi and internet data transfers has doubled every year since 2008 and is expected to continue at that rate at least through 2011. (Motorola, 2008)

The cost of video monitoring systems for mid-size agencies and municipalities is a major concern. Police agencies need to keep up with available federal grants available and lobby strongly for their current and future needs with their Congressman and other elected officials. These political relationships are an important component for law enforcement's sustainability and future viability. Whether it's new technologies, or the development of new organizational or operational structures, law enforcement's future will be sustained long-term with the sharing of innovative ideas that show how creative change results in solving crimes better. While it may be difficult to implement a large system today, creating a plan to build small programs that can be connected together in stages is a viable alternative.

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